For example, in the case where the spreading factor of the mask symbol is **64**, timing synchronization is conducted by using a MF with 64 taps. In this case, the symbol length coincides with the number of taps of the MF. With coefficients corresponding to one symbol set in the MF intact, therefore, it is possible to conduct despreading of the received signal and conduct search of all timing instants in the 64 chip section. Without increasing the gate size and power consumption, fast cell search thus becomes possible.

By referring to detailed description of preferred embodiments described below and accompanied drawing, these or other objects, features, and advantages will become more apparent.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a diagram showing a channel format of perch channels;

FIG. **2** is a diagram showing a channel format and transmission power of perch channels of a conventional system;

FIG. **3** is a diagram showing a channel format and transmission power of perch channels of a first embodiment;

FIG. **4** is a diagram showing a channel format and transmission power of perch channels of a second embodiment;

FIG. **5** is a diagram showing a channel format and transmission power of perch channels of a third embodiment;

FIG. **6** is a diagram showing a channel format and transmission power of perch channels of a fourth embodiment;

FIG. **7** is a diagram showing shortening of the search time, and reduction of the circuit scale and transmission power;

FIG. **8** is a configuration diagram of a mobile terminal;

FIG. **9** is a diagram showing a configuration example of a cell search timing synchronization unit of a mobile terminal;

FIG. **10** is a diagram showing a configuration example of a cell search GISC detection unit of a mobile terminal;

FIG. **11** is a diagram showing a configuration example of a first long code detection unit of a mobile terminal;

FIG. **12** is a diagram showing a configuration example of a second long code detection unit of a mobile terminal; and

FIG. **13** is a diagram showing time required at each stage of the cell search.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

First of all, the configuration of a mobile terminal used in a CDMA mobile communication system according to the present invention will be described by referring to FIG. **8**. A received signal of a carrier frequency received from an antenna is lowered in frequency by an RF unit **801**. The received signal of the baseband is inputted to a cell searcher **805** and a receiver **804** via an RF interface **802**. The cell searcher **805** conducts the above described cell search. The receiver **804** conducts despreading, error correction and the like of physical channels other than the perch channels. The decoded received signal is outputted via a user interface **807**, and subjected to subsequent processing. A transmission signal to be transmitted to the base station is inputted to a transmitter **803** via the user interface **807**. The transmitter **803** conducts coding and spreading of the transmission signal. A controller **806** conducts initial value setting in various units and timing management by using a DSP (Digital Signal Processor).

FIGS. **9** to **12** show configuration examples of respective blocks. FIG. **9** shows the configuration of a timing synchronizer **810**. In the timing synchronizer **810**, it is necessary to derive correlation values of timing corresponding to one symbol. Therefore, an MF **901** capable of providing correlation results at a plurality of timing instants at a time is used. As for coefficients of the MF **901**, CSC generated from a CSC encoder **902** is used. An accumulator **903** accumulates correlation values outputted from the MF for a plurality of slots. A peak detector **904** detects such a timing as to maximize the accumulated correlation values, as slot timing.

FIG. **10** shows a configuration example of a GISC detection unit **811**. FIG. **11** shows a configuration example of a first long code detection unit. FIG. **12** shows a configuration example of a second long code detection unit. A long code detection unit **812** includes a first long code detection unit and a second long code detection unit. In these circuits, frame/slot timing is already known by a timing detection unit. By arranging correlators **1001** in parallel for conducting despreading at one detected timing instant, high speed processing can be conducted efficiently.

The GISC detection unit **811** (FIG. **10**) stores a received signal of a long code masked symbol in a RAM **1002**. GISCs are specified in a GISC encoder **1003** one after another by the DSP. Correlation for each chip is thus derived. A correlation value in one symbol is derived by an accumulator **1004**. Such processing can be conducted at high speed by suitably conducting parallel processing. By selecting the highest one of the derived correlation values, the GISC is detected.

The first long code detection unit (FIG. **11**) calculates correlation values over approximately 10 symbols, and detects a long code used by the base station out of long codes belonging to a class corresponding to the detected GISC. Long codes specified in a long code generator **1102** one after another by the DSP are multiplied by a short code of the perch channels generated by a short code generator **1103**. Correlation of each timing is derived by a correlator **1001**. Correlation values corresponding to 10 symbols are accumulated by an accumulator **1101**. This processing is conducted in parallel with different long codes. On the basis of a result of accumulation of correlation values over approximately 10 symbols, a probable long code is designated.

For the long code designated by the first long code detection unit, the second long code detection unit (FIG. **12**) conducts processing similar to that of the first long code detection unit over one frame section. In the case where a predetermined accumulation value has been obtained, the cell search is completed.

A CDMA communication system performing a cell search method using the long code mask symbol will now be described centering around an example in which only the long code masked symbol portion of the perch channels typically transmitted at 16 ksps (spreading factor 256) is made to have a spreading factor of 64.

The spreading factor is not limited to 64. Similar effects can be obtained so long as the spreading factor is less than 256.

As a first embodiment, FIG. **3** shows a channel format and transmission power in the case where spreading factors of the CSC and GISC are made smaller (64 in the example) than those of other symbols of the perch channels, and the CSC and GISC are inserted at different timing instants. In order to prevent other ordinary symbol portions from being